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19.0 PIPELINE WELDING

19.1 INTRODUCTION

Welding procedures will be developed for mainline pipe (see Section 18), and the weld area wi11 be evaluated for fracture toughness. The minimum fracture toughness level has not yet been established.

The procedures will be documented before Notice to Proceed and will be included in the Design Review Package for approval.

19.2 CODES AND CRITERIA

19.2.1 Codes

- Code of Federal Regulations, Title 18 – Conservation of Power and Water Resources
- American Petroleum Institute (API) Standard 1104, Welding of Pipelines and Related Facilities
- American Society of Mechanical Engineers (ASME) Boiler and Pressure Code, Section IX
- Federal Energy Regulatory Commission conditional certificate of public convenience and necessity, issued on December 16, 1977, as such is finalized

19.2.2 Criteria

Three welding procedures are being considered: manual, semi-automatic, and mechanized/automated.

- Welding procedure documentation/records will be developed. The procedure qualifications will be in accordance with API Standard 1104, Sections 2, 9, and Appendix – Alternative Acceptance Standards for Girth Welds. Welding procedures for the following welding processes will be developed:
  - Manual shielded metal arc
  - Semi-automatic, solid, metal and flux cored wires, and inert gas shielding
  - Mechanized/automated systems
- Each welder will be qualified utilizing the manual shielded metal arc welding procedures.
- Welders assigned to tie-in welding will be qualified utilizing the semi-automatic welding procedures, if used.
- Welders assigned to production welding will be qualified utilizing the mechanized/automated welding procedures.

Repair procedures will be established for each welding process. Repair welders will be qualified utilizing the established procedures.

To qualify the weld procedure, welds will be tested for:

- Yield and Tensile strength
- Ductility (elongation)
  - Hardness
- Toughness
- Anomalies

19.3 DESIGN PROCEDURES

19.3.1 Mainline Procedures

- The mainline production welds will be welded utilizing the mechanized/automated welding methods. Shielded metal arc or semi-automatic methods may be used in specific areas.
- Tie-ins will be made using either manual-shielded metal arc, semi-automatic, or mechanized methods.
- Welders will be permitted to weld using only processes for which they are qualified.

19.3.2 Weld Ends

Weld end preparation is a major factor in producing a quality weld. They will be prepared for each welding method as follows:

- Manual and semi-automatic weld method:
  - The weld ends will be buffed to remove all rust and foreign material.
  - An end prep machine will be used to re-bevel the end if it is damaged or the end can not be cleaned sufficiently.
- Mechanized/automated weld method:
  - The weld ends will be prepared with the appropriate bevel using an end prep machine.
- The pipe ends must be aligned to provide the most favorable condition for depositing the root bead. This alignment must be preserved until the root bead is complete.

19.3.3 Marking

- Each welder will be assigned an identification number/symbol. The welder will mark the welds worked on by marking the pipe with the unique identification number/symbol.
- Each weld will be identified as to its position in the pipeline and the quality of each weld, repairs (when needed) and acceptance.

19.3.4 Testing

- Tie-ins and repair welds will be examined utilizing ultrasonic or radiographic techniques.
- Production welds will be examined utilizing mechanized ultrasonic examination methods.

19.3.5 Records

- Weld records will be handled and stored as required by state and federal regulations. The following information will be provided:
  - Weld identification
  - Non-destructive testing (NDT) records of each weld
  - Weld location of each weld in the pipeline